What Every Provider Needs to Know About Preventive Cardiology

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Disclosures

None
I. Describe the American Heart Association’s “Life’s Simple 7” factors for ideal cardiovascular health.

II. Explain the 2018 “Guideline on the Management of Blood Cholesterol.”

III. Discuss the role of coronary artery calcium scoring in coronary artery disease prevention.
Atherosclerotic Cardiovascular Disease

- **ASCVD**
  - Coronary artery disease
  - Stroke
  - Peripheral arterial disease
  - *Heart failure*

- **Epidemiology**
  - Underlying cause of around one third of all deaths, 841,000 in 2016
  - Estimated annual cost $351.2 billion in 2014-2015
  - 14% of total health expenditures

Benjamin E, *et al.* Circ. 2019
Ideal Cardiovascular Health: Life’s Simple 7

- Cigarette smoking
  Never or quit > 12 months ago
- Healthy diet
  4-5 components, Mediterranean-type diet
- Body mass index
  < 25 kg/m²
- Total cholesterol
  < 200 mg/dL (not treated)
- Physical activity
  >= 150 min/week, moderate intensity
- Fasting blood glucose
  < 100 mg/dL (not treated)
- Blood pressure
  < 120 / < 80 mmHg (not treated)

HIGH STANDARD: 17% adults >= 5 metrics (diet < 1%)

https://www.heart.org/en/professional/workplace-health/lifes-simple-7
Ideal Cardiovascular Health: Life’s Simple 7

Guo L and Zhang S. Clin Cardiol. 2017
Life’s Simple 7: Pearls in the Clinic

• Cigarette smoking  
  • Smoking cessation

• Healthy diet  
  • Mediterranean diet (Epic patient instructions)  
  • Dietary score:  
    • Fruits and vegetables: 4.5 cups or more per day  
    • Fish: two 3.5 oz servings or more per week (preferably oily fish)  
    • Fiber-rich whole grains: three 1-oz-equivalent servings or more per day  
    • Sodium: less than 1,500 mg per day  
    • Sugar-sweetened beverages: 450 kcal (36 oz) or less per week

• Body mass index  
  • List the diagnosis and discuss

• Total cholesterol  
  • Guideline-based

• Physical activity  
  • 30 min per day, 5 days per week  
  • >= 10K steps per day

• Fasting blood glucose  
  • More than metformin…  
  • ACC Expert Consensus Decision Pathway  
  • SGLT2 inhibitor (eg empagliflozin)  
  • GLP-1RAs (eg liraglutide)

• Blood pressure  
  • Too many guidelines – JNC 8 2014, ACC/AHA 2017, ESC/ESH 2018  
  • SPRINT believer: < 130/80 mmHg

Das SR, Everett BM, et al. JACC. 2018  
SPRINT. N Engl J Med. 2015
Guideline on the Management of Blood Cholesterol

• Focus on statins

• Statin benefit groups:
  1. Patients with clinical ASCVD
  2. Patients with LDL >= 190 mg/dl
  3. Patients with diabetes mellitus aged 40 to 75 years with LDL >= 70 mg/dl
  4. Patients with 10 year ASCVD risk >= 7.5%, aged 40 to 75 years with LDL >= 70 mg/dl

• Pooled-cohorts calculator
Pooled Cohorts ASCVD Risk Estimator Plus

Lifetime ASCVD Risk: 50%
Current 10-Year ASCVD Risk: 8.3%
Optimal ASCVD Risk: 2.2%

Current Age: 52
Sex: Male
Race: White

Systolic Blood Pressure (mm Hg): 135
Diastolic Blood Pressure (mm Hg): 78
Total Cholesterol (mg/dL): 214
HDL Cholesterol (mg/dL): 35
LDL Cholesterol (mg/dL): 114

History of Diabetes: Yes
Smoker: Yes
On Hypertension Treatment: Yes
On a Statin: Yes
On Aspirin Therapy: Yes

Do you want to refine current risk estimation using data from a previous visit? Yes
Pooled Cohorts ASCVD Risk Estimator Plus

Risk Reduction by Therapy

Review Therapy Advice for this Patient

- BP: For stage 1 HTN, manage with nonpharmacological therapy and have a repeat BP evaluation within 3 to 6 months.
- LDL-C: Moderate intensity statin is recommended if decided upon as part of a clinician-patient discussion.
- Smoking: Address smoking cessation as needed.

Lifestyle: This tool is meant to help decision making around use of statin, blood pressure medication, aspirin, and smoking cessation to lower risk, based on a particular evidence base. However, AHA/AACC guidelines stress the importance of lifestyle modification as the foundation to lowering cardiovascular disease risk, and decisions around these therapies are assumed to be in the context of guideline-recommended lifestyle interventions.

Project Risk Reduction by Therapy

6.3% with Statin Therapy

- Quit Smoking
- Start/Intensify Statin
- Start/Add Blood Pressure Medication
- Start/continue aspirin therapy

*Guidelines do not typically recommend aspirin therapy for patients with 10-year risk < 10%.*
Pooled Cohorts ASCVD Risk Estimator Plus

Treatment Advice
- ACC Lifestyle Recommendations
- LDL-C Therapy Advice for this Patient
- Blood Pressure Therapy Advice for this Patient
- Therapy Safety Information

Estimated 10-Year ASCVD Risk Profile

Inputs

*Projected Risk with the following therapies:
A = Start or continue taking aspirin
C = Manage cholesterol by starting or intensifying statin
B = Start and/or intensify blood pressure medication
S = Stop smoking for at least 2 years
Guideline on the Management of Blood Cholesterol

**Primary Prevention:**
- Assess ASCVD Risk in Each Age Group
- Emphasize Adherence to Healthy Lifestyle

**Treatment targets are back!**
- Very high risk, < 70 mg/dL

**Non-statin adjuncts**
- Ezetimibe
- PCSK9-inhibitors (price reduced!)

**ASCVD “risk enhancers”**
- Coronary artery calcium score

**Risk discussion and shared decision making**

Grundy SM et al. JACC. 2018
Guideline on the Management of Blood Cholesterol

• Ezetimibe
  • Inhibits small intestinal cholesterol absorption
  • Daily oral tablet
  • IMPROVE-IT: ezetimibe + simvastatin reduced CV death/MI/UA/revasc/CVA vs simvastatin alone (ARR 2%, RRR 6%)

• PCSK9 inhibitors (alirocumab and evolocumab)
  • Increases cell membrane LDL receptors, which reduces blood LDL
  • Every 2wk SC injection
  • ODYSSEY, FOURIER: > 50% reduction in LDL; MACE ARR 2%, RRR 15%

• Statin intolerance
  • Rare in RCTs, 1-5%
  • Observational/Clinical, 5-10%
  • Decrease dose and frequency

• Triglycerides
  • Fibrates for > 500 mg/dL to reduce pancreatitis
  • Think apoB

• Older than 75 years
  • PROSPER: pravastatin reduced MI/CV death/stroke/TIA in patients aged 70-82 years old (ARR 2%, RRR 15%)

Shepherd J et al. Lancet. 2002
Coronary Artery Calcium Score

- Pathophysiology
  - Atherosclerosis, inflammation, and ectopic osteogenesis
- Noncontrast CT chest
  - Quantification (Agatston)
  - Normal range varies by age, gender, and ethnicity
  - Score ranges: 0, 1-100, 101-400, > 400
    - Low (<1%), medium (1-3%), and high (>3%) annual risk death or MI
- CAC 0 “mortality warranty”
- Utility: Risk reclassification and patient/provider motivation

Greenland P et al. JACC. 2018
Coronary Artery Calcium Score

• Interpretation
  • MESA Calculators:
    1. CAC Score Reference Values
       • Percentile
    2. Arterial Age
       • Arterial age
       • Framingham 10 year risk
    3. MESA Risk Score Calculator
       • 10 year CHD risk

• Guidelines
  • USPSTF, 7/2018: Insufficient evidence
  • Blood Cholesterol, 2018

• Appropriate Use Criteria
  • Coronary revascularization in patients with stable ischemic heart disease, 2017

• Repeat scanning
  • 5 years, expert consensus

https://www.mesa-nhlbi.org/cacreference.aspx
Coronary Artery Calcium Score

Percentiles and Calcium Scores for: white male of age 52

<table>
<thead>
<tr>
<th>25th</th>
<th>50th</th>
<th>75th</th>
<th>90th</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>37</td>
<td>154</td>
</tr>
</tbody>
</table>

The observed calcium score of 45 is at percentile 77 for subjects of the same age, gender, and race/ethnicity who are free of clinical cardiovascular disease and treated diabetes.

Chart 1: Percentiles

The estimated arterial age for a person with a CAC score of 45 is 67 years (95% CI 65 - 68 years).

The estimated Framingham 10-year Hard CHD Risk is 12% using observed age, and 30% using arterial age.

MESA 10-Year CHD Risk with Coronary Artery Calcification

1. Gender
   - Male ☑ Female ❌

2. Age (45-85 years)
   - 52 Years

3. Coronary Artery Calcification
   - 45 Agatston

4. Race/Ethnicity
   - Choose One
     - Caucasian ☑
     - Chinese ❌
     - African ❌
     - American ❌
     - Hispanic ❌

5. Diabetes
   - Yes ☑ No ❌

6. Currently Smoke
   - Yes ☑ No ❌

7. Family History of Heart Attack
   - History in parents, siblings, or children
   - Yes ☑ No ❌

8. Total Cholesterol
   - 214 mg/dL or 5.5 mmol/L

9. HDL Cholesterol
   - 35 mg/dL or .9 mmol/L

10. Systolic Blood Pressure
    - 135 mmHg or 18 kPa

11. Lipid Lowering Medication
    - Yes ☑ No ❌

12. Hypertension Medication
    - Yes ☑ No ❌

Calculate 10-year CHD risk

The estimated 10-year risk of a CHD event for a person with this risk factor profile including coronary calcium is 11.8%. The estimated 10-year risk of a CHD event for a person with this risk factor profile if we did not factor in their coronary calcium score would be 10.5%.
## Coronary Artery Calcium Score

### Primary Prevention Recommendations for Adults 40 to 75 Years of Age With LDL Levels 70 to 189 mg/dL (1.7–4.8 mmol/L)

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| IIa | B-NR | In intermediate-risk adults or selected borderline-risk adults in whom a CAC score is measured for the purpose of making a treatment decision, AND  
• If the coronary calcium score is zero, it is reasonable to withhold statin therapy and reassess in 5 to 10 years, as long as higher risk conditions are absent (diabetes mellitus, family history of premature CHD, cigarette smoking);  
• If CAC score is 1 to 99, it is reasonable to initiate statin therapy for patients ≥55 years of age;  
• If CAC score is 100 or higher or in the 75th percentile or higher, it is reasonable to initiate statin therapy. |
Coronary Artery Calcium Score

<table>
<thead>
<tr>
<th>CAC Measurement Candidates Who Might Benefit from Knowing Their CAC Score Is Zero</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Patients reluctant to initiate statin therapy who wish to understand their</td>
</tr>
<tr>
<td>risk and potential for benefit more precisely</td>
</tr>
<tr>
<td>• Patients concerned about need to reinstitute statin therapy after</td>
</tr>
<tr>
<td>discontinuation for statin-associated symptoms</td>
</tr>
<tr>
<td>• Older patients (men, 55-80 y of age; women, 60-80 y of age) with low</td>
</tr>
<tr>
<td>burden of risk factors who question whether they would benefit from</td>
</tr>
<tr>
<td>statin therapy</td>
</tr>
<tr>
<td>• Middle-aged adults (40-55 y of age) with PCE-calculated 10-year risk of</td>
</tr>
<tr>
<td>ASCVD 5% to &lt;7.5% with factors that increase their ASCVD risk, although</td>
</tr>
<tr>
<td>they are in a borderline risk group</td>
</tr>
</tbody>
</table>
Coronary Artery Calcium Score

**CENTRAL ILLUSTRATION** Proposed Decision-Making Approach to Selective Use of Coronary Artery Calcium Measurement for Risk Prediction

Using 10-year ASCVD risk estimate plus coronary artery calcium (CAC) score to guide statin therapy

<table>
<thead>
<tr>
<th>Patient’s 10-year atherosclerotic cardiovascular disease (ASCVD) risk estimate:</th>
<th>&lt;5%</th>
<th>5-7.5%</th>
<th>&gt;7.5-20%</th>
<th>&gt;20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting ASCVD risk estimate alone</td>
<td>Statin not recommended</td>
<td>Consider for statin</td>
<td>Recommend statin</td>
<td>Recommend statin</td>
</tr>
<tr>
<td>Consulting ASCVD risk estimate + CAC</td>
<td>Statin not recommended</td>
<td>Statin not recommended</td>
<td>Statin not recommended</td>
<td>Recommend statin</td>
</tr>
<tr>
<td>If CAC score =0</td>
<td>Statin not recommended</td>
<td>Consider for statin</td>
<td>Recommend statin</td>
<td>Recommend statin</td>
</tr>
<tr>
<td>If CAC score &gt;0</td>
<td>Statin not recommended</td>
<td>Statin not recommended</td>
<td>Statin not recommended</td>
<td>Recommend statin</td>
</tr>
<tr>
<td>Does CAC score modify treatment plan?</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
</tr>
</tbody>
</table>

CAC not effective for this population

CAC can reclassify risk up or down


The figure shows a modified approach to the guideline-based decision making by incorporating a consideration of coronary artery calcium (CAC) testing to reclassify a patient’s risk up or down where it would make a clinically important change in the clinical decision. Adapted with permission from Heir et al. (93).
Summary

- ASCVD is a leading cause of death and driver of health expenditures
- Prevention is the responsibility of all providers
- Life’s simple 7:
  - Cigarette smoking, healthy diet, body mass index, total cholesterol, physical activity, fasting blood glucose, blood pressure

- Management of Blood Cholesterol
  - Statin benefit groups
  - ASCVD risk prediction
  - Statin adjuncts

- Coronary artery calcium score
  - Risk reclassification
  - Patient/provider motivation
Competency Question 1

1. Which measure associated with ideal cardiovascular health is associated with the largest relative risk reduction in cardiovascular and all-cause mortality?

   a) Total cholesterol
   b) Smoking
   c) Fasting plasma glucose
   d) Healthy diet
   e) Blood pressure
Competency Question 2

2. What risk groups benefit from lipid lowering therapy according to the current guidelines (issued in 2013, with an update in 2018) for the management of blood cholesterol?

a) Patients with clinical ASCVD
b) Patients with LDL $\geq 190$ mg/dl
c) Patients with diabetes mellitus aged 40 to 75 years with LDL $\geq 70$ mg/dl
d) Patients with 10 year ASCVD risk $\geq 7.5\%$, aged 40 to 75 years with LDL $\geq 70$ mg/dl
e) All of the above
Competency Question 3

3. How can the coronary artery calcium score be used to influence the management of blood cholesterol, according the 2018 guidelines?

a) If CAC is zero and a patient is a nonsmoker, nondiabetic, and does not have a family history of premature ASCVD, statin therapy may be withheld or delayed

b) If CAC is $\geq 100$ or $\geq 75$th percentile, statin therapy is indicated

c) If CAC is 1 to 99, statin therapy is favored, especially in those $\geq 55$ years of age

d) All of the above.
Acknowledgements

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• Linda Groarke
• Conference Planning Committee

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Questions?